BIOPHYSICAL HABITAT UNITS OF THE LOWER HALFWAY STUDY AREA:

EXPANDED LEGEND

Ministry of
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Wildlife Branch
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CHAPTER ONE - INTRODUCTION

1.1 Objectives

This project was requested by the Fish and Wildlife Branch, British Columbia Ministry of Environment, Fort St. John to map ungulate habitat to aid in assessment of ungulate capability and suitability, and provide a framework for enhancement. The information can also be used to describe habitat for other animals. Previous studies in the area include Harcombe (1978), Thompson et al. (1980), Harcombe et al. (1980), Jang et al. (1986) and DeLong (1988) describing vegetation, and Fuhr (1980), Blood (1979), and Silver (1976) describing wildlife habitat.

Appreciation goes to Craig DeLong (MOF), Andy MacKinnon (MOF), and Andy Stewart (MOE) for reviewing this report. Marla Zarelli, Dauna Walker and Darla Cooper word processed the report.

1.2 Study Area

The study area includes N.T.S. map sheets 94A/5 and 6 and those portions of N.T.S. 94A/3 and 4, not covered by the study of Thompson et al. (1980). The present study area is mapped for ungulate habitat at a 1:50 000 scale.

1.3 Methods

Soils, terrain, vegetation and wildlife habitat were assessed by field work in July and August, 1986. One hundred and five sample plots were collected, following sampling procedures outlined in Walmsley et al. (1980) and using forms described in Sondheim et al. (1983) and Pendergast et al. (1982). The plots were selected to be representative of various kinds of sites with distinct soil/surficial material, topographic position, topoclimate and successional stage. As well 25 plots provided by the Ministry of Forests, Forest Science Section, Prince George and 90 plots provided by the B.C. Ministry of Environment, Waste Management Branch, Victoria, were used to help develop Habitat Unit descriptions. Common plant names follow Meidinger (1987). A species list is given in Appendix A.

CHAPTER TWO - BIOPHYSICAL HABITAT CLASSIFICATION AND SYMBOLS

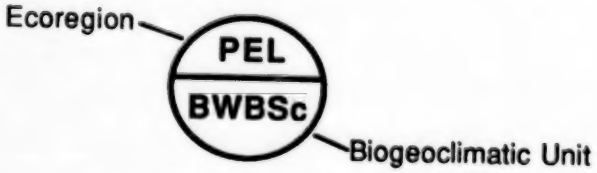
2.1 Classification System

Three levels of biophysical classification are used in mapping habitat. These include Ecoregions, Biogeoclimatic Units (subzones) and Biophysical Habitat Units. Ecoregions are a broad level of ecological differentiation based on macroclimatic processes, regional physiography, vegetation and wildlife biogeography (Demarchi 1988). Biogeoclimatic Subzones are areas over which a distinct climatic climax community or zonal ecosystem occurs (Pojar 1983). A subzone consists of unique sequences of geographically related ecosystems. Biophysical Habitat Units are areas within Biogeoclimatic Units that are relatively homogeneous with regard to soils, surficial materials, topographic position, disturbance history, topoclimate, animal use and trends of secondary succession. Two Ecoregions, one Biogeoclimatic Subzone and twenty-three Biophysical Habitat Units, each of which may be divided into five successional stages, are present in the study area.

2.2 Examples of Map Unit Labels

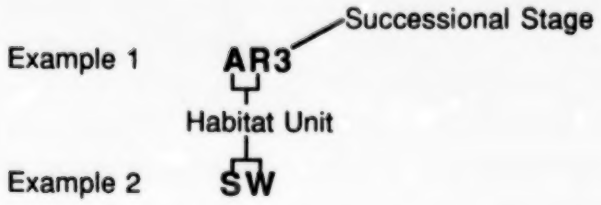
On the maps and in this booklet legend the following types of map unit symbols occur:

Ecoregions and Biogeoclimatic Units



(the symbols within the circular labels are described in Section 3.1 and 3.2)

Biophysical Habitat Units



The successional stages include:

1. Shrub/herb
2. Pole/sapling (less than 20 years old)
3. Young Forests (20 - 60 years old)
4. Mature Forest (60 - 140 years old)
5. Old-growth Forests (greater than 140 years old)

Successional stage numbers are not used for non-forested units.
(The Habitat Units and their stages are described in Section 3.3)

CHAPTER THREE - DESCRIPTIONS OF MAP UNITS

3.1 Ecoregions

Five levels of Ecoregions are described for British Columbia (Demarchi 1987). All of the study area occurs within the Polar Ecodomain, Boreal Ecodivision, Boreal Plains Ecoprovince and Alberta Plateau Ecoregion. The Alberta Plateau Ecoregion has three sections, two of which occur in the study area, the Peace Lowland Ecosection (PEL) and the Sikanni-Beatton Plateau Ecosection (SBU).

Map Symbol	Ecosection	Description
	Peace Lowland (PEL)	This low elevation area was a former glacial lake bottom. Snow depths are low. Broad-leaved forests and agricultural fields are extensive. This high diversity wildlife area provides wintering habitat for mule deer, white-tailed deer, moose, and Rocky Mountain elk. This area has a wide variety of bird species, many which are not common in other parts of British Columbia.
	Sikanni-Beatton Plateau (SBU)	This area is at higher elevations and has greater topographic relief than the Peace Lowland Ecosection. Coniferous and mixed forests are common. Winter range for ungulates is more limited than in the Peace Lowland Ecosection due to deeper snow, although in mild winters the area is used extensively.

3.2 Biogeoclimatic Units

Only one Biogeoclimatic Subzone was recognized for the study area, the BWBSc[1] - Moist Cool Southern Boreal White and Black Spruce Subzone. The British Columbia Ministry of Forests (McLeod and Meidinger 1985; Research Branch 1987) have previously mapped the study area. Much of this area appears to have had repeated fires that have created extensive stands of trembling aspen, particularly at lower elevations.

Map Symbol	Biogeoclimatic Unit	Description
PEL / BWBSc SBU / BWBSc	Moist, Cool, Southern Boreal White and Black Spruce Subzone (BWBSc)	This subzone occurs in both Ecosections (see 3.1). It is characterized by having climatic climax forests of white spruce, with an understory of highbush-cranberry, prickly rose, bunchberry, creamy peavine and tall bluebells. At low elevations, extensive stands of trembling aspen occur, while at higher elevations and in northern parts of the study area, mixed stands of white spruce and trembling aspen occur, with lesser amounts of lodgepole pine, balsam poplar, paper birch and black spruce. Wetlands are common in flatter areas.

[1]This BWBSc subzone is now known as the BWBSmw1 - Peace Moist Warm Boreal White and Black Spruce variant (C. DeLong, personal communication, 1989).

3.3 Biophysical Habitat Units

The following Habitat Units have been mapped and are described in this section:

AR Trembling aspen - prickly rose fine-textured soil
ARc Trembling aspen - prickly rose fine-textured soil, crest
ARr Trembling aspen - prickly rose fine-textured soil, ridge
AS Trembling aspen - saskatoon southerly aspect
*BA Barren - escarpment
BD Paper birch - red-osier dogwood cool, northerly aspect
BP Black spruce - sphagnum bog
BS Black spruce upland
*CF Cultivated field
*GB Gravel bar
LS Lodgepole pine - soopolallie coarse-textured soil
*PA Pasture
PC Balsam poplar - highbush-cranberry moist soil
*RO Rock outcrop
SB White spruce - bunchberry medium-textured soil
SBc White spruce - bunchberry medium-textured soil, crest
SBr White spruce - bunchberry medium-textured soil, ridge
SP White spruce - balsam poplar floodplain
SS Scrub birch - sedge fen
SW Saskatoon - slender wheatgrass southerly aspect
*UR Urban
WB Bebb's willow - bluejoint swamp
WI Willow swamp

* These Habitat Units are not further described in this report.

AR Trembling aspen - prickly rose fine-textured soil habitat unit					
Description: gentle to moderately sloped areas of lacustrine or morainal materials; average moisture regime; subjected to repeated fires in the past; low elevation sites.					
	Map Symbol	AR1	AR2	AR3	AR4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	dense shrub cover of: willow, trembling aspen, fireweed, creamy peavine, tall bluebells, blue-joint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creamy peavine, bunchberry, twinflower, bluejoint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creamy peavine, bunchberry, twinflower, bluejoint	dense broad-leaved forests of: trembling aspen, Sitka alder, highbush-cranberry, prickly rose, bunchberry, bluejoint, twinflower
	Associates	prickly rose, highbush-cranberry, saskatoon, showy aster, heart-leaved arnica, trailing raspberry	saskatoon, soopolallie, showy aster, fireweed, trailing raspberry, American vetch	Sitka alder, soopolallie, saskatoon, showy aster, fireweed, trailing raspberry, American vetch	paper birch, willow, birch-leaved spirea, wild sarsaparilla, trailing raspberry, fireweed, creamy peavine
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows, trembling aspen	willow, trembling aspen, prickly rose	prickly rose	—
	Moderate (5 - 15% cover)	prickly rose, highbush-cranberry, saskatoon, red honeysuckle, paper birch	saskatoon red honeysuckle highbush-cranberry	saskatoon red honeysuckle highbush-cranberry	prickly rose willows saskatoon highbush-cranberry
Comments: repeated burns in early successional stages create a dense willow cover; this unit has been subjected to repeated fires which has removed conifer seed sources; these are similar sites as the White spruce - bunchberry medium-textured soil habitat unit (SB).					

ARc Trembling aspen - prickly rose fine-textured soil, crest habitat unit					
Description: gentle to moderately sloped areas of lacustrine or morainal materials at the crest of escarpments; average moisture regime; subject to repeated fires in the past; low elevation sites.					
	Map Symbol	ARc1	ARc2	ARc3	ARc4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	dense shrub cover of: willow, trembling aspen, fireweed, creamy peavine, tall bluebells, blue-joint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creamy peavine, bunchberry, twinflower, bluejoint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creamy peavine bunchberry, twinflower, bluejoint	dense broad-leaved forests of: trembling aspen, Sitka alder, highbush-cranberry, prickly rose, bunchberry, bluejoint, twinflower
	Associates	prickly rose, highbush-cranberry, saskatoon, showy aster, heart-leaved arnica, trailing raspberry	saskatoon, soopolallie, showy aster, fireweed, trailing raspberry, American vetch	Sitka alder, soopolallie, saskatoon, showy aster, fireweed, trailing raspberry, American vetch	paper birch, willow, birch-leaved spirea, wild sarsaparilla, trailing raspberry, fireweed, creamy peavine
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows, trembling aspen	willow, trembling aspen, prickly rose	prickly rose	—
	Moderate (5 - 15% cover)	prickly rose, highbush-cranberry, saskatoon, red honeysuckle, paper birch	saskatoon red honeysuckle highbush-cranberry	saskatoon red honeysuckle highbush-cranberry	prickly rose willows saskatoon highbush-cranberry
Comments: repeated burns in early successional stages create a dense willow cover; this unit has been subjected to repeated fires which has removed conifer seed sources; these are similar sites as the White spruce - bunchberry medium-textured soil, crest habitat unit (SBc).					

ARr Trembling aspen - prickly rose fine-textured soil, ridge habitat unit					
Description: gentle to moderately sloped areas of lacustrine or morainal materials found on ridge of hills; average moisture regime; subjected to repeated fires in the past; low elevation sites.					
	Map Symbol	ARr1	ARr2	ARr3	ARr4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	dense shrub cover of: willow, trembling aspen, fireweed, creeping peavine, tall bluebells, bluejoint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creeping peavine, bunchberry, twinflower, bluejoint	dense broad-leaved forest of: trembling aspen, willow, prickly rose, highbush-cranberry, creeping peavine, bunchberry, twinflower, bluejoint	dense broad-leaved forests of: trembling aspen, Sitka alder, highbush-cranberry, prickly rose, bunchberry, bluejoint, twinflower
	Associates	prickly rose, highbush-cranberry, saskatoon, showy aster, heart-leaved arnica, trailing raspberry	saskatoon, soopolallie, showy aster, fireweed, trailing raspberry, American vetch	Sitka alder, soopolallie, saskatoon, showy aster, fireweed, trailing raspberry, American vetch	paper birch, willow, birch-leaved spirea, wild sarsaparilla, trailing raspberry, fireweed, creeping peavine
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows, trembling aspen	willow, trembling aspen, prickly rose	prickly rose	—
	Moderate (5 - 15% cover)	prickly rose, highbush-cranberry, saskatoon, red honeysuckle, paper birch	saskatoon red honeysuckle highbush-cranberry	saskatoon red honeysuckle highbush-cranberry	prickly rose willows saskatoon highbush-cranberry
Comments: repeated burns in early successional stages create a dense willow cover; this unit has been subjected to repeated fires which has removed conifer seed sources; these are similar sites as the White spruce - bunchberry medium-textured soil, ridge habitat unit (SBr).					

AS Trembling aspen - saskatoon southerly aspect habitat unit					
Description: gentle to moderate slopes of southeast to west aspects; solar radiation is high; droughty sites					
	Map Symbol	AS1	AS2	AS3	AS4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	shrub dominated cover of: saskatoon, trembling aspen, prickly rose, showy aster, fuzzy-spiked wildrye, creamy peavine	dense broad-leaved forest of: trembling aspen, saskatoon, prickly rose, showy aster, fuzzy-spiked wildrye, creamy peavine	dense broad-leaved forest of: trembling aspen, saskatoon, prickly rose, showy aster, fuzzy-spiked wildrye, creamy peavine	dense broad-leaved forests of: trembling aspen, saskatoon, prickly rose, showy aster, fuzzy-spiked wildrye, creamy peavine
	Associates	choke cherry, snowberry, soopolallie, wild sarsaparilla, northern bedstraw, slender wheatgrass, fireweed	choke cherry, snowberry, soopolallie, birch-leaved spirea, wild sarsaparilla northern bedstraw, western meadowrue	choke cherry, snowberry, soopolallie, birch-leaved spirea, wild sarsaparilla northern bedstraw, western meadowrue	choke cherry, snowberry, soopolallie, birch-leaved spirea, wild sarsaparilla northern bedstraw, western meadowrue, trailing raspberry
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	saskatoon trembling aspen	saskatoon trembling aspen	saskatoon	saskatoon
	Moderate (5 - 15% cover)	prickly rose choke cherry snowberry willow fuzzy-spiked wildrye slender wheatgrass	prickly rose choke cherry snowberry willow fuzzy-spiked wildrye	prickly rose choke cherry snowberry highbush-cranberry fuzzy-spiked wildrye	prickly rose choke cherry snowberry highbush-cranberry fuzzy-spiked wildrye
Comments: productive forage areas; dense shrub layers in all successional stages; white spruce may occur in later successional stages in northern parts of the study area; soils/surficial materials are sensitive to erosion, gullying and mass failure					

BO Paper birch - red-osier dogwood cool, northerly aspect habitat unit.					
Description: steep, cool, easterly and northerly aspects of major river and creek valleys; usually colluvial surficial material.					
	Map Symbol	BO1	BO2	BO3	BO4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	shrub dominated cover of: saskatoon paper birch trembling aspen spreading dogbane creamy peavine	closed forests of: paper birch, trembling aspen, balsam poplar, red-osier dogwood, soopolallie, saskatoon, creamy peavine	closed forests of: paper birch, white spruce red-osier dogwood, highbush-cranberry, twinflower	closed forests of: white spruce, red-osier dogwood, highbush-cranberry, twinflower, moderate to dense moss cover
	Associates	balsam poplar prickly rose choke cherry asters	highbush-cranberry prickly rose choke cherry twinflower	balsam poplar, trembling aspen, soopolallie, prickly rose, saskatoon, creamy peavine	paper birch, prickly rose, snowberry, bunchberry, trailing raspberry, one-sided wintergreen
Potential Winter Forage For Wild Ungulates	Abundant (above 15% cover)	saskatoon, paper birch, trembling aspen, balsam poplar	paper birch trembling aspen balsam poplar	—	—
	Moderate (5 - 15% cover)	willow, red-osier dogwood snowberry, highbush-cranberry, prickly rose, wolf-willow, choke cherry	willow, saskatoon, red-osier dogwood, snowberry, highbush-cranberry, prickly rose, choke cherry	willow, red-osier dogwood saskatoon snowberry highbush-cranberry prickly rose	red-osier dogwood saskatoon highbush-cranberry prickly rose
Comments: good shrub production in early successional stages; sensitive sites due to steep slopes and unstable moist to wet soils; these sites may be good shrub producing areas after repeated burns and may be valuable for ungulate forage, particularly if they are intermixed with warmer aspects.					

BP Black spruce - sphagnum bog habitat unit.		
Description: level or depressional areas of shallow to deep organic material; high water table for most of year; often has permafrost.		
	Map Symbol	BP
	Stage	Edaphic Climax
Vegetation	Dominants	open treed bog of: black spruce Labrador tea a dense cover of sphagnum
	Associates	tamarack, scrub birch bog cranberry, lingonberry, sedges, dwarf nagoonberry, horse-tails, other moss species
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	—
	Moderate (5 - 15% cover)	scrub birch sedges
Comments: low forage production for ungulates.		

BS Black spruce upland habitat unit.					
Description: Occurs on gently sloping morainal or fluvial materials with moister to drier than average soils.					
	Map Symbol	**BS1**	**BS2**	**BS3**	**BS4**
	Stage	**Shrub-Herb**	**Pole-Sapling**	**Young Forests**	**Mature Forests**
Successional Trends	**Dominants**	shrub dominated cover of: willows Labrador tea velvet-leaved blueberry fireweed	open forests of: lodgepole pine, black spruce, Labrador tea, velvet-leaved blueberry, bunchberry, twinflower, fireweed	open forests of: black spruce, Labrador tea, velvet-leaved blueberry, bunchberry, twinflower, lingonberry	open forests of: black spruce, Labrador tea, velvet-leaved blueberry, bunchberry, twinflower, lingonberry
	Associates	prickly rose soopolallie bunchberry twinflower sedges	willows, prickly rose, soopolallie, dwarf blueberry, lingonberry, dwarf scouring-rush, sedges	lodgepole pine, prickly rose, soopolallie, dwarf blueberry, dwarf scouring-rush, sedges	lodgepole pine, prickly rose, soopolallie, dwarf blueberry, dwarf scouring-rush, sedges
Potential Winter Forage for Wild Ungulates	**Abundant (above 15% cover)**	willows	—	—	—
	Moderate (5 - 15% cover)	sedges prickly rose	willows prickly rose sedges	prickly rose sedges	prickly rose sedges
Comments: these sites may have various amounts of balsam poplar, trembling aspen, white spruce and tamarack; low forage availability; limited area.					

LS Lodgepole pine - soopolallie coarse-textured soil habitat unit.					
Description: sandy or gravelly soils of fluvial terraces or sandy, windblown (aeolian) deposits; droughty soils with low nutrient availability; level to gently sloping.					
	Map Symbol	**LS1**	**LS2**	**LS3**	**LS4**
	Stage	**Shrub-Herb**	**Pole-Sapling**	**Young Forests**	**Mature Forests**
Successional Trends	Dominants	shrub cover of: willow trembling aspen soopolallie prickly rose twinflower	open to closed forests of: lodgepole pine trembling aspen soopolallie prickly rose twinflower creamy peavine	open to closed forests of: lodgepole pine trembling aspen soopolallie prickly rose twinflower creamy peavine	closed forests of: lodgepole pine, white spruce, soopolallie, prickly rose, twinflower, creamy peavine, moderate moss cover
	Associates	saskatoon kinnikinnick bunchberry fireweed	saskatoon kinnikinnick bunchberry	white spruce, black spruce, saskatoon, kinnikinnick, lingonberry bunchberry, rough-leaved ricegrass	trembling aspen, black spruce, saskatoon, kinnikinnick, lingonberry, bunchberry, wild lily-of-the-valley
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	trembling aspen willows	—	—	—
	Moderate (5 - 15% cover)	prickly rose saskatoon highbush-cranberry	trembling aspen prickly rose saskatoon highbush-cranberry willow	prickly rose saskatoon highbush-cranberry	prickly rose saskatoon highbush-cranberry
Comments: litter layers are important nutrient reservoirs; repeated burns are likely to degrade site.					

PC Balsam poplar - highbush-cranberry moist soil habitat unit.						
Description: moist, receiving sites of fine-textured soils developed on lacustrine, morainal or fluvial materials.						
	Map Symbol	PC1	PC2	PC3	PC4	PC5
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests	Old growth Forests
Successional Trends	Dominants	dense shrub cover of: willows balsam poplar trembling aspen prickly rose	dense forests of: balsam poplar prickly rose highbush-cranberry tall bluebells creeping peavine	dense forests of: balsam poplar prickly rose highbush-cranberry tall bluebells creeping peavine	dense forests of: balsam poplar prickly rose highbush-cranberry tall bluebells creeping peavine	dense forests of: balsam poplar prickly rose highbush-cranberry tall bluebells creeping peavine
	Associates	highbush-cranberry, red-osier dogwood, currants, horsetails, fireweed, creeping peavine	trembling aspen, willow, red-osier dogwood, currants, palmate coltsfoot, horsetails, cow-parsnip	trembling aspen, willow, red-osier dogwood, currants, palmate coltsfoot, horsetails, cow-parsnip	trembling aspen, willow red-osier dogwood, currants, palmate coltsfoot, horsetails, cow-parsnip	trembling aspen, willow red-osier dogwood, currants, palmate coltsfoot, horsetails, cow-parsnip
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows, balsam poplar, trembling aspen	willows, trembling aspen, prickly rose	prickly rose	prickly rose	prickly rose
	Moderate (5 - 15% cover)	prickly rose highbush-cranberry red-osier dogwood choke cherry red raspberry, saskatoon	highbush-cranberry red-osier dogwood choke cherry red raspberry, snowberry, willow, saskatoon	highbush-cranberry red-osier dogwood choke cherry red raspberry, snowberry, willow, saskatoon	highbush-cranberry red-osier dogwood choke cherry red raspberry,snowberry, willow, saskatoon	highbush-cranberry red-osier dogwood choke cherry red raspberry,snowberry, willow, saskatoon
Comments: red-osier dogwood or alder may dominate the understory of this unit; repeated burns in early successional stages create a dense willow cover; white spruce may be common in later successional stages, particularly in northern areas.						

SB White spruce - bunchberry medium-textured soil habitat unit						
Description: gently sloped areas of morainal or lacustrine material; average moisture regime; found in northern areas and upper elevations of the study area.						
	Map Symbol	SB1	SB2	SB3	SB4	SB5
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests	Old Growth Forests
Successional Trends	Dominants	dense shrub cover of: willows trembling aspen highbush-cranberry bunchberry bluejoint fireweed	dense forests of: white spruce, trembling aspen, willows, highbush-cranberry, prickly rose, bluejoint, bunchberry, moderate moss cover	dense forests of: white spruce, trembling aspen, highbush-cranberry prickly rose, bunchberry, bluejoint, dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint dense moss layer
	Associates	paper birch heart-leaved arnica creeping peavine tall bluebells	lodgepole pine paper birch soopolallie creeping peavine tall bluebells palmate coltsfoot	lodgepole pine paper birch soopolallie creeping peavine tall bluebells palmate coltsfoot	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows highbush-cranberry	highbush-cranberry	highbush-cranberry	—	—
	Moderate (5 - 15% cover)	trembling aspen paper birch prickly rose saskatoon	trembling aspen paper birch willow prickly rose saskatoon	prickly rose saskatoon willow	highbush-cranberry prickly rose	highbush-cranberry prickly rose
Comments: similar sites as the Trembling aspen - prickly rose fine-textured soil (AR) habitat unit but this unit has less fire history; repeated burns in early successional stages create a dense willow cover and removes conifer seed sources.						

S8c White spruce - bunchberry medium-textured soil, crest habitat unit						
Description: gently sloped areas of morainal or lacustrine material at the crest of escarpments; average moisture regime; found in northern areas and upper elevations of the study area.						
	Map Symbol	S8c1	S8c2	S8c3	S8c4	S8c5
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests	Old Growth Forests
Successional Trends	Dominants	dense shrub cover of: willows trembling aspen highbush-cranberry bunchberry bluejoint fireweed	dense forests of: white spruce, trembling aspen, willows, highbush-cranberry, prickly rose, bluejoint, bunchberry, moderate moss cover	dense forests of: white spruce, trembling aspen, highbush-cranberry prickly rose, bunchberry, bluejoint, dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint dense moss layer
	Associates	paper birch heart-leaved arnica creamy peavine tall bluebells palmate coltsfoot	lodgepole pine paper birch soopolallie creamy peavine tall bluebells palmate coltsfoot	lodgepole pine paper birch soopolallie creamy peavine tall bluebells palmate coltsfoot	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows highbush-cranberry	highbush-cranberry	highbush-cranberry	—	—
	Moderate (5 - 15% cover)	trembling aspen paper birch prickly rose saskatoon	trembling aspen paper birch willow prickly rose saskatoon	prickly rose saskatoon willow	highbush-cranberry prickly rose	highbush-cranberry prickly rose
Comments: similar sites as the Trembling aspen - prickly rose fine-textured soil, crest (ARc) habitat unit but this unit has less fire history; repeated burns in early successional stages create a dense willow cover and removes conifer seed sources.						

SBr White spruce - bunchberry medium-textured soil, ridge habitat unit						
Description: gently sloped areas of morainal or lacustrine material found on ridges of hills; average moisture regime; found in northern areas and upper elevations of the study area.						
	Map Symbol	SBr1	SBr2	SBr3	SBr4	SBr5
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests	Old Growth Forests
Successional Trends	Dominants	dense shrub cover of: willows trembling aspen highbush-cranberry bunchberry bluejoint fireweed	dense forests of: white spruce, trembling aspen, willows, highbush-cranberry, prickly rose, bluejoint, bunchberry, moderate moss cover	dense forests of: white spruce, trembling aspen, highbush-cranberry prickly rose, bunchberry, bluejoint dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint, dense moss layer	dense forests of: white spruce highbush-cranberry bunchberry bluejoint dense moss layer
	Associates	paper birch heart-leaved arnica creeping peavine tall bluebells	lodgepole pine paper birch soopolallie creeping peavine tall bluebells palmate coltsfoot	lodgepole pine paper birch soopolallie creeping peavine tall bluebells palmate coltsfoot	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells	lodgepole pine trembling aspen prickly rose soopolallie tall bluebells
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows highbush-cranberry	highbush-cranberry	highbush-cranberry	—	—
	Moderate (5 - 15% cover)	trembling aspen paper birch prickly rose saskatoon	trembling aspen paper birch willow prickly rose saskatoon	prickly rose saskatoon willow	highbush-cranberry prickly rose	highbush-cranberry prickly rose
Comments: similar sites as the Trembling aspen - prickly rose fine-textured soil, ridge (ARr) habitat unit but this unit has less fire history; repeated burns in early successional stages create a dense willow cover and removes conifer seed sources.						

SP White spruce - balsam poplar floodplain habitat unit					
Description: occurs on fluvial materials on floodplain sites; relatively high water table during parts of the year.					
	Map Symbol	SP1	SP2	SP3	SP4
	Stage	Shrub-Herb	Pole-Sapling	Young Forests	Mature Forests
Successional Trends	Dominants	dense shrub cover of: balsam poplar willow paper birch wolf-willow red-osier dogwood wheatgrass	dense forests of: balsam poplar red-osier dogwood prickly rose	dense forests of: balsam poplar white spruce red-osier dogwood prickly rose	dense forests of: white spruce balsam poplar red-osier dogwood prickly rose wild sarsaparilla
	Associates	rose grasses trailing raspberry Canada goldenrod dandelion	paper birch white spruce willow wolf-willow trailing raspberry	paper birch willow snowberry trailing raspberry twinflower	paper birch snowberry trailing raspberry twinflower
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	balsam poplar, willow, wolf-willow, red-osier dogwood	red-osier dogwood prickly rose	red-osier dogwood prickly rose	red-osier dogwood prickly rose
	Moderate (5 - 15% cover)	paper birch prickly rose saskatoon highbush-cranberry	saskatoon highbush-cranberry wolf-willow choke cherry	saskatoon highbush-cranberry wolf-willow choke cherry, snowberry	saskatoon highbush-cranberry wolf-willow choke cherry, snowberry
Comments: high forage-producing areas; slightly drier, upper floodplains have smaller shrub layers with a herb and moss cover dominated by twinflower, bunchberry, trailing raspberry, wild sarsaparilla and mosses; wetter sites have abundant horsetails.					

SS Scrub birch fen habitat unit		
Description: level or depressional areas of shallow to deep organic material; high water table for most of year.		
	Map Symbol	SS
	Stage	Edaphic Climax
Vegetation	Dominants	low to tall shrub cover of: willows scrub birch sedges sickle moss (Drepanocladus spp.)
	Associates	tamarack, arrow-leaved coltsfoot bluejoint dwarf nagoonberry, horsetails, other moss species
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows scrub birch, sedges
	Moderate (5 - 15% cover)	-
Comments: good forage production; tamarack may often dominate these sites, particularly on areas with hummocky terrain; wetter sites may have buckbean and arrow-grass; purple reedgrass may be abundant.		

SW Saskatoon - slender wheatgrass southerly aspect habitat unit		
Description: moderate to steep slopes of southeast to west aspects; droughty sites; various surficial materials; topoedaphic shrub/grassland climax.		
	Map Symbol	SW
	Stage	Edaphic Climax
Vegetation	Dominants	shrub/grassland of: saskatoon choke cherry prickly rose slender wheatgrass pasture sage
	Associates	snowberry trembling aspen wolf-willow, sedges, junegrass, northern bedstraw, asters
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	saskatoon, choke cherry, slender wheatgrass
	Moderate (5 - 15% cover)	prickly rose snowberry trembling aspen wolf-willow pasture sage, Junegrass
Comments: very steep areas have very low shrub cover and are grass-dominated; heavy grazing on these sites promotes bare soil, sparse vegetation, and accelerated soil erosion, particularly on steeper slopes; various other grass species may occur including fuzzy-spiked wildrye, needlegrasses, bluegrass and fescue.		

WB Bebb's willow - bluejoint swamp habitat unit		
Description: imperfectly to poorly drained mineral soils of level to depressional sites; fine textured soils of lacustrine or morainal material.		
	Map Symbol	WB
	Stage	Edaphic Climax
Vegetation	Dominants	tall shrub cover of: Bebb's willow alder (mountain or Sitka) bluejoint tall bluebells stinging nettle
	Associates	black twinberry highbush-cranberry currants, common horsetail, fireweed trailing raspberry
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willows bluejoint
	Moderate (5 - 15% cover)	highbush-cranberry black twinberry currants
Comments: the willows may be out of reach of ungulates.		

WI Willow swamp habitat unit		
Description: floodplain of small creek areas; high water table for much of growing season; seasonal deposition of material.		
	Map Symbol	WI
	Stage	Edaphic Climax
Vegetation	Dominants	tall shrub cover of: willow common horsetail bentgrass
	Associates	balsam poplar sedges western meadowrue American vetch cow-parsnip
Potential Winter Forage for Wild Ungulates	Abundant (above 15% cover)	willow
	Moderate (5 - 15% cover)	balsam poplar black twinberry
Comments: Willows may be out of reach of ungulates.		

3.4 Correlation of Biophysical Habitat Units

The following table correlates the present study's Biophysical Habitat Units to the Ministry of Forests Ecosystems Associations (Jang et al. 1986; DeLong 1988) and to the Ministry of Environment Pine-Moberly study (Thompson et al. 1980).

Present Study Biophysical Habitat Units		Ministry of Forests Climax Ecosystem (Jang et al. 1986) Ministry of Forests Seral Ecosystems[1] (DeLong. 1988)		Ministry of Environment's Pine-Moberly study (Thompson et al. 1980)	
Map Symbol	Name	Symbol	Name	Symbol	Name
AR	Trembling aspen - prickly rose fine-textured soils	BWBSc/01	Highbush-cranberry - trailing raspberry	AP	Trembling aspen - balsam poplar
ARc	Trembling aspen - prickly rose fine-textured soil, crest	(BWBSc/01-$)	(Trembling aspen - creamy peavine)		
ARr	Trembling aspen - prickly rose fine-textured soil, ridge				
AS	Trembling aspen - saskatoon southerly aspect	BWBSc/02	Pine - Soopolallie	SA	Common saskatoon - trembling aspen
		(BWBSc/02-$)	(Trembling aspen - soopolallie)		
BA	Barren-escarpment		none		none
BD	Paper birch - red-osier dogwood cool, northerly aspect		none	SA	Common saskatoon - trembling aspen
BP	Black spruce - sphagnum bog	BWBSc/08	Black spruce - horsetail	TS	Tamarack - sphagnum moss
BS	Black spruce upland	BWBSc/04	Pine - black spruce	BS	Black spruce
CF	Cultivated Field		none	CA	Cultivated area
GB	Gravel bar		none		none
LS	Lodgepole pine - soopolallie coarse-textured soil	BWBSc/02	Pine - kinnikinnick	LP	Lodgepole pine
		(BWBSc/02-$)	(Trembling aspen - kinnikinnick)	TA	Trembling aspen
PA	Pasture		none		none
PC	Balsam poplar - highbush-cranberry moist soil	BWBSc/06	Highbush-cranberry - tall bluebells	SB	White spruce - birch
		(BWBSc/07-$)	(Balsam poplar - cow-parsnip)		
RO	Rock outcrop		none		none
SB	White spruce - bunchberry medium-textured soil	BWBSc/01	Highbush-cranberry - trailing raspberry	AP	Trembling aspen - balsam poplar
SBc	White spruce - bunchberry medium-textured soil, crest	(BWBSc/01-$)	(Trembling aspen - creamy peavine)	PS	Lodgepole pine - white spruce
SBr	White-spruce - bunchberry medium-textured soil, ridge				
SP	White spruce - balsam poplar floodplain		none	SP	White spruce - balsam poplar
SS	Scrub birch - sedge fen		none	SG	Sedge-grass
WB	Bebb's willow - bluejoint swamp		none		none
WI	Willow swamp		none	WI	Willow
SW	Saskatoon - slender wheatgrass southerly aspect		none	SA	Common saskatoon - trembling aspen

[1]Seral ecosystems of the Ministry of Forests (DeLong 1988) are indicated in parentheses in this table. The Habitat Units of the present study include all possible successional communities that may be found on a particular unit.

CHAPTER FOUR - SURFICIAL MATERIALS - SOIL SENSITIVITY

The Lower Halfway Study Area is characterized by two major landforms: flat to gently sloping plains of glacial lakebottom sediments and rolling uplands mantled by glacial tills.

The glacial lake sediments have been deeply incised by watercourses leaving long, steep, unstable escarpments subject to major and minor slope failure. The scarps are also vulnerable to increased gullying, sheet and rill erosion when protective vegetative cover is removed. Glacial lake sediments back from the scarp edges are more stable but when wet, are subject to puddling and compaction by mechanized operations. Portions of the old lakebed veneered by sands or organics are comparatively stable.

The glacial tills of the study area are fine-textured but comparatively stable as they occur on relatively gentle topography. Patches of coarse-textured, comparatively stable colluvium occur where the local sandstones/ conglomerates outcrop. Floodplains of smaller tributaries are commonly wet and fine-textured with meandering watercoures. Floodplains and terraces along the Peace River are generally either sandy or pebbly sandy textured, free draining and comparatively stable. However, despite the water control on the Peace, these areas could still be subject to occasional major fluvial inundations with accompanying erosion and sedimentation.

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APPENDIX A - SPECIES LIST

The following is a list of common names used in the text and their corresponding botanical names.

Common Name	Botanical Name
alder	*Alnus* spp.
American vetch	*Vicia americana*
arrow-grass	*Triglochin* spp.
arrow-leaved coltsfoot	*Petasites sagittatus*
aster	*Aster* spp.
balsam poplar	*Populus balsamifera* ssp. *balsamifera*
Bebb's willow	*Salix bebbiana*
bentgrass	*Agrostis* spp.
birch-leaved spirea	*Spiraea betulifolia*
black spruce	*Picea mariana*
black twinberry	*Lonicera involucrata*
bluebells	*Mertensia paniculata*
bluegrass	*Poa* spp.
bluejoint	*Calamagrostis canadensis*
bog cranberry	*Vaccinium oxycoccos*
buckbean	*Menyanthes trifoliata*
bunchberry	*Cornus canadensis*
Canada goldenrod	*Solidago canadensis*
choke cherry	*Prunus virginiana*
common horsetail	*Equisetum arvense*
cow-parsnip	*Heracleum sphondylium*
creamy peavine	*Lathyrus ochroleucus*
currants	*Ribes* spp.
dandelion	*Taraxacum officinale*
dwarf blueberry	*Vaccinium caespitosum*
dwarf nagoonberry	*Rubus arcticus*
dwarf scouring-rush	*Equisetum scirpoides*
fescue	*Festuca* spp.
fireweed	*Epilobium angustifolium*
fuzzy-spiked wildrye	*Elymus innovatus*
heart-leaved arnica	*Arnica cordifolia*
highbush-cranberry	*Viburnum edule*
horsetail	*Equisetum* spp.
junegrass	*Koeleria macrantha*
kinnikinnick	*Arctostaphylos uva-ursi*
Labrador tea	*Ledum groenlandicum*
lingonberry	*Vaccinium vitis-idaea*
lodgepole pine	*Pinus contorta*

Common Name	Botanical Name
mountain alder	*Alnus incana* ssp. *tenuifolia*
needlegrass	*Stipa* spp.
northern bedstraw	*Galium boreale*
one-sided wintergreen	*Orthilia secunda*
palmate-leaved coltsfoot	*Petasites palmatus*
paper birch	*Betula papyrifera*
pasture sage	*Artemisia frigida*
prickly rose	*Rosa acicularis*
purple reedgrass	*Calamagrostis purpurascens*
red honeysuckle	*Lonicera dioica*
red raspberry	*Rubus idaeus*
red-osier dogwood	*Cornus sericea*
rose	*Rosa* spp.
rough-leaved ricegrass	*Oryzopsis asperifolia*
saskatoon	*Amelanchier alnifolia*
scrub birch	*Betula glandulosa*
sedges	*Carex* spp.
showy aster	*Aster conspicuus*
Sitka alder	*Alnus viridis* spp. *sinuata*
slender wheatgrass	*Agropyron pauciflorum*
snowberry	*Symphoricarpos* spp.
soopolallie	*Shepherdia canadensis*
sphagnum	*Sphagnum* spp.
spreading dogbane	*Apocynum androsaemifolum*
stinging nettle	*Urtica dioica*
tall bluebells	*Mertensia paniculata*
tamarack	*Larix laricina*
trailing raspberry	*Rubus pubescens*
trembling aspen	*Populus tremuloides*
twinflower	*Linnaea borealis*
velvet-leaved blueberry	*Vaccinium myrtilloides*
western meadowrue	*Thalictrum occidentale*
wheatgrass	*Agropyron* spp.
white spruce	*Picea glauca*
wild lily-of-the-valley	*Maianthemum canadense*
wild sarsaparilla	*Aralia nudicaulis*
willow	*Salix* spp.
wolf-willow	*Elaeagnus commutata*

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